

Atty. Dkt.: UCF-388

Appl No.: 10/786,282

REMARKS/ARGUMENTS

Favorable consideration of this application is respectfully requested. Applicant has amended claims 1, 3, 7, 8, 9, 13, 15 and 20 and canceled claims 2, 14, 25 and 26. Favorable reconsideration of this application is, consequently, earnestly solicited in view of the following remarks.

Claims 1, 2, 4, 6-9, 13, 14, 16 and 18-21 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application No. 2003/0160928 (Ozawa) in view of U.S. Patent No. 6,400,433 (Arakawa).

In regard to claims 1, 2, 13 and 14, claims 1 and 13 have been amended to include the limitation of an empty hole in the common electrode and claims 2 and 13 have been canceled. Claims 1 and 13 have been further amended to add the limitation that the empty hole is located above the first protrusion shaped electrode as described between page 6, line 21 and page 7, line 8 and as shown in Fig. 5.

The subject application has several major differences from Ozawa's in device structure, operation mechanism, and functionality. In regard to electrode structure, Ozawa discloses a window 31M in the common electrode 31 as shown in Fig. 5. However, the windows are located on the outside of the inclined area K, not directly above the insulating film 21 between the inclined areas K. Therefore, Ozawa includes a window (empty hole) on the side of the insulating layer (protrusion shaped electrode) not directly above the protrusion shaped electrode as claimed in amended claims 1 and 13. The directly above placement of the common election hole is a novel requirement that produces an electric field that causes the novel flower-shaped vertical alignment recited in the preamble and in the body of the claim.

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Furthermore, in both Figs. 3 and 5 of Ozawa, element 20 represents a reflective film which is not present in the device structure described and claimed in the subject application. Because of the different electrode structures, their corresponding device operation mechanisms are different.

In the subject application, as shown in Fig. 6, the electric fields generated by the top common and bottom pixel electrodes are pointing to opposite directions and have both vertical and horizontal components. Only a very narrow line of liquid crystal molecules on the center of the bottom electrode are not reoriented by the symmetric electric fields. However, in Ozawa's device structure, the electric fields above element 21 are mainly longitudinal. They do reorient the liquid crystal molecules. However, the backlight in this region is blocked by the reflective film 20 and cannot transmit through this region.

In regard to the optical performance differences, when the backlight from the bottom substrate enters the device as shown in Figs. 4, 5 and 6 of the subject application, nearly all the LC molecules contribute to the light transmittance due to the full use of fringe field effect. There is only a black line in the center of the protrusion. So, the light transmittance is high.

In Ozawa's disclosure, when the backlight from the bottom substrate enters the device, the reflective film 20 and the dye layer 22R in Fig. 5 blocks the backlight transmission. The corresponding region forms a dead zone. Therefore, the light transmittance is lowered. For these reasons, Applicant believes that amended claims 1 and 13 are allowable and requests removal of the rejection.

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Furthermore, Arakawa is non-analogous art. Arakawa's patent describes the fabrication method of a circularly polarized plate. The subject application discloses a liquid crystal display having flower-shaped vertical alignment liquid crystal. The polarizers produces polarized light, but it is the electrode structure that produces the flower-shaped vertical alignment. A reference is considered reasonably pertinent if it is one which logically would have commended itself to the inventor's attention in considering his problem. The problem solved in the subject application is alignment of the liquid crystal to produce a flower-shaped vertical alignment having a fast response time, improved contrast ratio and a wide viewing angle. Circular polarizers are a subfield of liquid crystal displays because circular polarizers may be used with liquid crystal displays. In the subfield, the polarizers may include a variety of different films for achieving the polarization of the light, but they do not align the liquid crystal.

Application of a circular polarizer on the exterior surface of a liquid crystal substrate merely polarizes the light entering the device. The configuration of the electrodes aligns the liquid crystal. Therefore, use of Arakawa's polarizer on the exterior surface would not produce the novel flower-shaped vertical alignment. That requires an electrode configuration as shown in Fig. 5 of the subject application.

In regard to claims 4, 6-9, 16 and 18-20, Applicant agrees that Ozawa discloses the claimed shapes of the pixel electrode (claim 6), use of indium tin oxide layer on pixel electrode (claim 7) and common electrode (claim 9); and the shape of the empty hole claimed in claim 8. However, Ozawa does not disclose an empty hole in the common electrode layer above the protrusion shaped pixel electrode as claimed in amended claim 1. Therefore, for the reasons provided in regard to claim 1, Applicant believes that claims

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4, 6-9, 13, 16 and 18-20 are allowable under section 103(a) and requests removal of the rejection.

Claims 3, 5, 10-12, 15, 17, and 22-26 were rejected under 35 U.S.C. 103(a) as being unpatentable over Ozawa in view of Arakawa and further in view of Shimoshikiryo (Claims 3 and 15), Lu (claims 5 and 17), Ikeda (claims 10 and 22), Matsuyama (claims 11 and 23), Yoshida (claims 12 and 24), and Kona (claims 25 and 26). Claims 25 and 26 have been canceled.

Even though Shimoshikiryo discloses a hexagon shaped hole, Lu discloses use of an inorganic aligning layer, Ikeda discloses bump protrusions, and Matsuyama and Yoshida disclose a vertically aligned mode display compatible with either positive or negative dielectric anisotropy liquid crystal, the respective references do not overcome the deficiencies of Ozawa. None of the references teach an empty hole in the common electrode above a protrusion shaped pixel electrode. For the reasons provided in regard to claims 1 and 13, Application believes that claims 3, 5, 10-12, 15, 17, and 22-24 are patentable under section 103(a) and requests removal of the respective rejection.

In view of the foregoing considerations, it is respectfully urged that claims 1, 3-13 and 15-24 be allowed. Such action is respectfully requested. If the Examiner believes that an interview would be helpful, the Examiner is requested to contact the attorney at the below listed number.

Respectfully Submitted;


Brian S. Steinberger
Registration No. 36,423
101 Brevard Avenue
Cocoa, Florida 32922
Telephone: (321) 633-5080

Date

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